

REMARKS

Claims 1-71 remain pending in this application. Of these claims, claims 1-8, 11, 13-33, 36, 38-54, 56 and 58-71 stand rejected under 35 USC §102(b) as being clearly anticipated by Fuderer et al. Claims 9 and 34 stand rejected under 35 USC §103(a) as being unpatentable over Fuderer et al. in view of Lemcoff et al. '656. Claims 10, 35 and 55 stand rejected under 35 USC §103(a) as being unpatentable over Fuderer et al. in view of Lemcoff et al. '423. Claims 12, 37 and 57 stand rejected under 35 USC §103(a) as being unpatentable over Fuderer et al. in view of Towler et al. and Gittleman et al.

In view of the preceding amendments and the following remarks, these rejections are traversed, and reconsideration of this application is respectfully requested.

Applicant's invention is a pressure swing adsorption (PSA) system for purifying a gas that has particular application for purifying hydrogen for a fuel cell system. The PSA system includes a plurality of vessels that include an adsorbent for adsorbing impurities in a feed gas to provide the purified gas. The vessels are cycled through a predetermined sequence of steps, including pressure equalization, product gas formation, blow-down, purge, etc., as defined in independent claims 1, 28 and 52. Because Applicant's claimed PSA system is for purifying hydrogen in a fuel cell system, it operates at relatively low pressures, such as 7 bar or below, and preferable 3 bar and below, because the purity of the product hydrogen does not need to be as high as other PSA systems for other applications.

U.S. Patent No. 3,986,849 issued to Fuderer et al. discloses a PSA system that includes a plurality of vessels for purifying a hydrogen product gas. As discussed in Fuderer et al., the PSA system is intended to provide very high hydrogen

purity, typically on the order of 99.9999%. Further, as is also discussed in the various examples in Fuderer et al., the PSA system operates at a pressure of about 10 bar and above. Because Applicant's PSA system does not need to provide such a high purity of hydrogen, it does not need to operate at such high pressures, thus the sequence of steps in the PSA process can be different than that taught by Fuderer et al.

Figure 2 of Applicant's specification shows the sequence of steps in the PSA process of the invention for a nine bed PSA system. Figure 2 of Fuderer et al. shows the sequence of steps for their ten bed PSA system. In Applicant's claimed invention, the blow-down (BD) stage follows an equalization down stage that is reducing the pressure in the particular vessel. Support for this can be found in paragraphs [0048] and [0049] of the specification. In the Fuderer et al. PSA process, the blow-down (BD) stage occurs after the product pressurization (PP) stage. Applicant's claimed product pressurization (PP) stage follows a pressure equalization up stage where the pressure in the particular vessel is increasing. Support for this can be found in paragraphs [0052] and [0053] of the specification. In the Fuderer et al. PSA process, the product pressurization (PP) stage follows a pressure equalization down stage where the pressure in the particular vessel is decreasing. Applicant submits that the product pressurization (PP) stage in the Fuderer et al. PSA process cannot be provided after a pressure equalization up stage as in Applicant's claimed invention because that change would reduce the purity level of the product gas.

Further, the Fuderer et al. PSA process includes a final feed-pressurization (FR) step. This final feed pressurization is not part of Applicant's cycle, and goes to the requirement of the necessity for a higher pressure in the Fuderer et al. PSA process. Also, Applicant's purge stage is longer than the purge stage disclosed in

the Fuderer et al. PSA process, which also goes to the ability that Applicant's PSA process can be operated at a lower pressure.

Applicant submits that Fuderer et al. cannot anticipate Applicant's independent claims 1, 28 and 52 because of the position of the product pressurization (PP) stage in the PSA cycle as discussed above. In order to more specifically claim this feature of Applicant's invention, independent claims 1, 28 and 52 have been amended above to state that the blow-down (BD) stage directly follows an equalization down stage and the product pressurization (PP) stage directly follows an equalization up stage. Because Fuderer et al. does not teach or suggest this sequence of PSA cycle steps, Applicant respectfully submits that Fuderer et al. cannot anticipate or make obvious Applicant's claimed invention.

U.S. Patent No. 5,820,656 issued to Lemcoff et al. discloses a PSA system. It is believed that the Examiner is relying on Lemcoff et al. '656 to teach the use of rotary valves at the feed and product end of the adsorber vessels. However, Applicant submits that Lemcoff et al. '656 fails to teach or suggest the sequence of PSA cycle steps as discussed above, and therefore cannot be combined with Fuderer et al. to make Applicant's claimed invention obvious.

U.S. Patent No. 5,807,423 issued to Lemcoff et al. also discloses a PSA system using rotary valves. It is believed that the Examiner is relying on Lemcoff '423 to teach a single rotary valve type of system. However, Applicant submits that Lemcoff et al. '423 fails to teach or suggest the sequence of PSA cycle steps as discussed above, and therefore, cannot be combined with Fuderer et al. to make Applicant's claimed invention obvious.

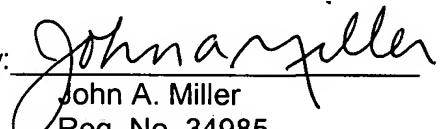
U.S. Patent No. 6,299,994 issued to Towler et al. discloses a system and method for providing hydrogen to a fuel cell. U.S. Patent Applicant Publication

2002/0110504 to Gittleman et al. discloses an apparatus for removing carbon monoxide from a hydrogen gas stream for a hydrogen fuel cell system. It is believed that the Examiner is relying on Towler et al. and Gittleman et al. to teach providing purified product hydrogen to a fuel cell. However, Towler et al. and Gittleman et al. do not teach or suggest PSA systems, and therefore fail to provide the teaching missing from Fuderer et al. to make Applicant's claimed invention obvious.

In view of the preceding remarks, it is respectfully requested that the §102(b) rejection and §103(a) rejections be withdrawn.

It is now believed that this application is in condition for allowance. If the Examiner believes that personal contact with Applicant's representative would expedite prosecution of this application, he is invited to call the undersigned at his convenience.

Respectfully submitted,

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